threes, adhering to the stipes by the narrow ends. *Capsules* cylindric, 6-ribbed, *ca* 0.5 mm long.

Specimens examined: South Nicobar: Great Nicobar Is., *N. P. Balakrishnan* 6082. Ibid. *N. G. Nair* 7125 (PBL).

Distributions: Nicobar Islands, Malaysia, Sumatra, Java, New Guinea and Taiwan.

Notes: The characteristic appendage on the lip and the number of pollinia easily distinguish the genus. This species is a new record for India.

2. **Diploprora championi** (Lindl.) Hook. f. Fl. Brit. Ind. 6: 26. 1890 et Ic. Pl. t. 2120. 1892; King & Pantl. in Ann. Roy. Bot. Gard. Calc. 8: 205, pl. 274. 1898; Seidenfaden & Smitinand, Orch. Thailand 573, f. 430. 1963; Saldanha in Fl. Hassan 824. 1976; Koyama in Fl. Taiwan 5: 975, pl. 1587. 1978; Pradhan, Indian Orch. 2: 531. 1979. *Cottonia championi* Lindl. in Hooker's Journ. Bot. Kew Gard. Misc. 7: 35. 1855.

Epiphytes. *Stems* 8-15 cm long, covered by leaf sheaths. *Leaves* oblong-lanceolate, fleshy, acute-acuminate at apex; nerves many, parallel, prominent when dry, 6-10 cm long, 1.5-2.0 cm broad, articulate on sheath; sheaths tubular, striate, oblique at mouth. *Racemes* axillary, 3-6-flowered, 5-10 cm long. *Flowers* yellow, 6-9 cm long, 5-7 mm wide. *Sepals* oblong, obtuse at apex, *ca* 8 mm long. *Petals* shorter and narrower than sepals. *Lip* yellowish with brown tinge on margins; hypochile broad and cymbiform; epichile narrow, bifid to form two thin, caudate tails at apex. *Capsules* 2.5-4.0 cm long, 0.2-0.4 cm diam., striate.

Specimens examined: South Andamans: Gopalakabang, *King's collector*, s. n. (CAL!); *N. G. Nair* 4286 Jirkatang and 6974 Miletilek (PBL).

Distribution: India: Andaman Is., Sikkim, Meghalaya, Arunachal Pradesh, Karnataka; Bhutan, S. China, Hongkong, Taiwan, Thailand, Burma.

Notes: The occurrence of this widely distributed species in Andaman islands was not recognized as early collections were wrongly identified to be *Pteroceros berkeleyi* (Reichb. f.) Holtt. But the undivided characteristic lip with bifid apex and concave hypochile is distinct for the species.

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A REVIEW OF THE ANDROECIUM IN STERCULIACEAE WITH A KEY TO THE GENERA

Various earlier authors including Bentham & Hooker (1862), Masters (1874), Schumann (1890) and several others have laid stress on the characters of the stamens in the family Sterculiaceae.

Flowers in Sterculiaceae are unisexual or bisexual or polygamous in some genera like, *Sterculia* L., *Pterygota* Schott. & Endl. and *Firmiana* Marsili. The androecium has been described by various authors as being columnar or tubular, of many stamens; stamens rarely few, free; anthers in a head or in a ring at the apex of the column or arranged along the edge of a cup or tube with intervening staminodes.

The androecia of Sterculiaceae have been interpreted to consist usually of an antesepalous whorl which is staminodial or completely suppressed and an antepetalous whorl which is fertile and has increased in number by chorisis.

Male as well as bisexual flowers of *Sterculia, Pterygota* and *Firmiana* and bisexual flowers of *Reevisia* Lindl. have 10-15 stamens whereas *Heritiera* Aiton has 4-5 stamens, but in all these genera stamens are borne on a long column in a cluster or arranged in a peripheral ring at the top. The stamens of *Heritiera* are described as consisting of one thecae but according to Kostermans (1959) in this genus also anthers have 2-thecae. In these genera, the staminal columns, in male and bisexual flowers, are adnate to the gynophore.

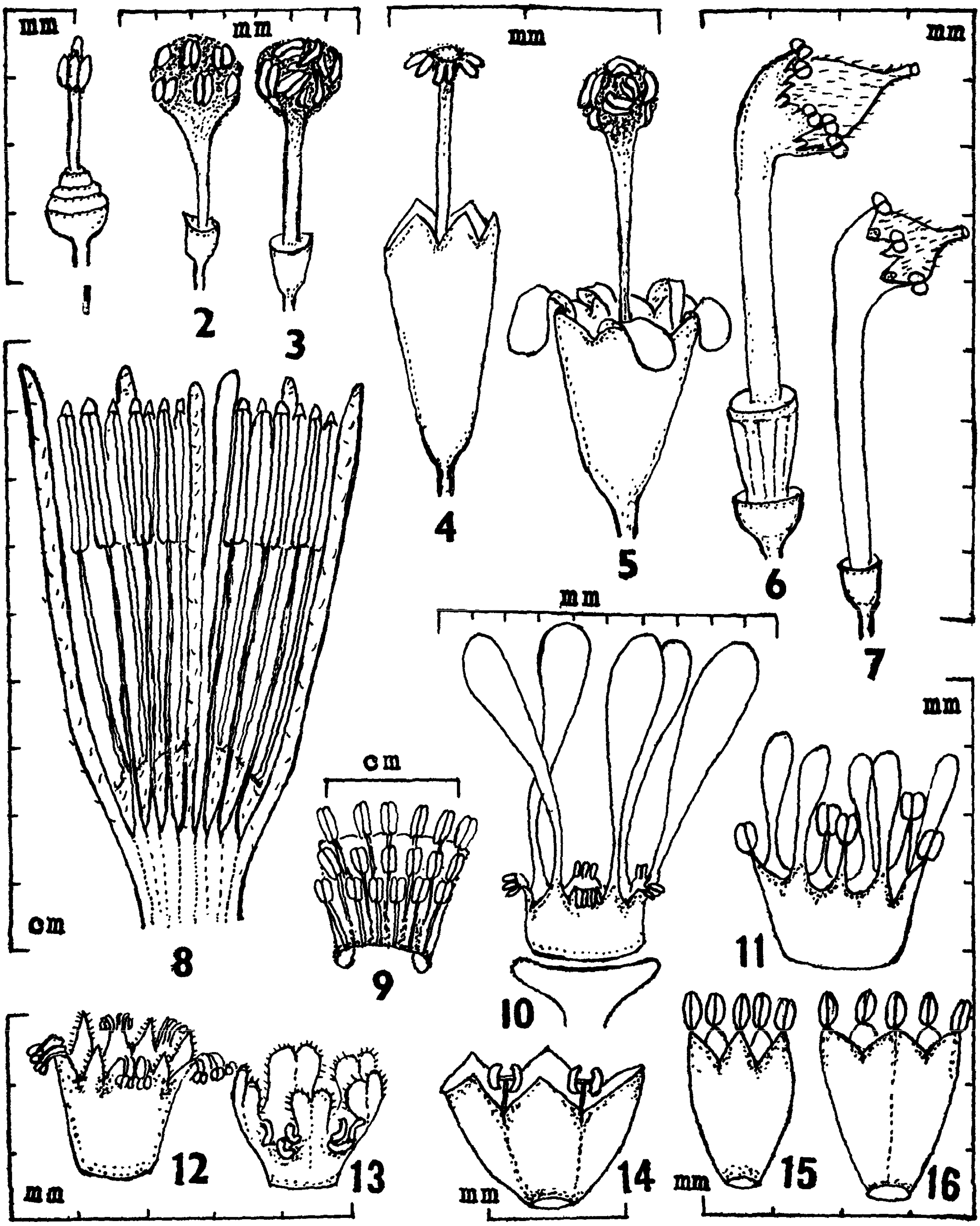
Kleinhovia L., *Helicteres* L. and *Pterospermum* Schreb. bear bisexual flowers, with stamens on a long column and adnate to the gynophore. *Kleinhovia* has 15 stamens on a 5-fid apical cup, each lobe bearing 3 stamens and alternate with one staminode. In *Helicteres,* stamens are 10, on a 5-fid apical cup, and each lobe alternating with one staminode bears 2 stamens. Here, staminodes develop from the inner wall of the staminal column. In both the genera anther-lobes are divergent. In *Pterospermum,* there are 5 groups of 3 stamens and the groups are alternating with a solitary staminode. Anther-lobes are parallel in this genus.

Androecia in *Eriolaena* DC., *Pentapetes* L., *Melhania* Forsk., *Guazuma* Plum., *Abroma* Jacq., *Byttneria* L., *Melochia* L. and *Waltheria* L. are arranged on a basal staminal cup or tube. In *Eriolaena,* the staminal tube bears on its outside, antheriferous filaments. In *Pentapetes, Abroma* and *Guazuma* there is one whorl of three stamens in five groups and each group alternates with one staminode. But in *Melhania* and *Byttneria,* there are 5 stamens only, without intervening staminodes. *Guazuma* and *Byttneria* differ from all other genera in having stamens covered by the petals. In *Guazuma,* the stamens are reflexed towards the petals and the hooded apices of the petals cover the stamens. In *Byttneria,* petals develop their base a pair of pouches which cover the stamens. Here stamens develop from the inner side of the staminodial cup.

Though the androecia in some genera appear to be in a cluster, where there is no intervening staminodes and in others they are in one whorl with staminodes, anatomical data show that they are originally members of two or rarely three whorls.

In *Sterculia foetida* L., Rao (1952) has seen that there are traces of two whorls. van Heel (1966) also observed that in *Sterculia* the ten stamens have two whorls of equidistant basally fused stamens at the top of the column. In *Kleinhovia* and *Pterospermum* there are traces of different whorls which emerge in one whorl. Among those genera having a staminal column, *Helicteres* has staminodial trace suppressed and the staminodes are the members of the staminal whorl. In *Eriolaena,* there are one to three whorls (van Heel, 1966). In other genera where stamens are in a basal cup, excepting *Melochia* and *Waltheria,* there are also traces of two different whorls, though they emerge afterwards giving rise to externally one whorl comprising of both stamens and staminodes. In *Melochia* and *Waltheria,* there is trace of only one whorl and the staminodial traces have been completely suppressed.

The above review leads to the conclusion that reduction has taken place both in number of staminal whorl as well as in number of stamens in the family Sterculiaceae. Two (three)-whorled conditions have been reduced to one-whorled condition. With re-



Staminal columns of : 1. *Heritiera* Aiton (*H. fomes* Buch.). 2. *Sterculia* L. (*S. foetida* L.). 3. *Pterygota* Schott. & Endl. (*P. alata* R. Br.). 4. *Firmiana* Marsili [*F. colorata* (Roxb.) R. Br.]. 5. *Reevisia* Lindl. (*R. wallichii* R. Br.). 6. *Kleinhovia* L. (*K. hospita* L.). 7. *Helicteres* L. (*H. isora* L.). 8. *Pterospermum* Schreb. (*P. acerifolium* Willd.). 9. *Eriolaena* DC. (*E. quinquelocularis* Wt.). 10. *Pentapetes* L. (*P. phoenicea* L.). 11. *Melhania* Forsk. (*M. incana* Heyne). 12. *Guazuma* Plum. (*G. tomentosa* Kunth). 13. *Abroma* Jacq. (*A. augusta* L.). 14. *Byttneria* L. (*B. herbacea* Roxb.). 15. *Melochia* L. (*M. corchorifolia* L.) and 16. *Waltheria* L. (*W. indica* L.)

duction in number of stamens from 10-15 to 5, reaching at its maximum in *Melochia* and *Waltheria*, a tetracyclic pentamerous condition has arrived. *Melhania* and *Byttneria* appear to be the condition prior to that of *Melochia* and *Waltheria*. Due to the complete suppression of the staminodial trace and that of branching of the staminal trace androecia in these last two genera have given rise to only five stamens in a single whorl and thus, these two genera are considered to be most advanced in the Sterculiaceae. Hutchinson (1969) has considered, *Waltheria* as the most advanced genus in the family due to the reduction of its gynoecium to a single carpel.

A key to the genera on the basis of the androecia is given below:

1a. Androecia columnar ; anthers clustered or arranged in a ring at the top of the column or on five apical divisions :
2a. Anthers 4-5 in a ring below the sterile ovaries ... 1. *Heritiera*
2b. Anthers clustered or in groups on the column, often covering the sterile or fertile ovaries :
3a. Columns usually with stamens only, rarely stamens and carpels both in polygamous species :
4a. Columns enclosed in the flowers even after anthesis :
5a. Columns with a cluster or a ring of 10-15 anthers at the top ... 2. *Sterculia*
5b. Columns with 4-5 groups of 4 anthers ... 3. *Pterygota*
4b. Columns exserted from the flower after anthesis ... 4. *Firmiana*
3b. Columns bear both stamens and carpels :
6a. Staminodes absent ... 5. *Reevisia*
6b. Staminodes present :
7a. Columns curved at apex ; anthers divergent ; staminodes tooth-like :
8a. Base of the columns with a striated sheath ... 6. *Kleinhovia*
8b. Base of the columns without striated sheath ... 7. *Helicteres*
7b. Columns straight ; anthers parallel ; staminodes club-shaped ... 8. *Pterospermum*
1b. Androecia on a basal cup with anthers in five groups on it or a basal tube being antheriferous along the whole length :
9a. Stamens in whorls outside the staminal tube ... 9. *Eriolaena*
9b. Stamens in groups at the apex of staminal cup :
10a. Staminodes present :
11a. Anthers in groups of three (solitary in *Melhania*) alternating with the staminodes :
12a. Staminodes club-shaped ; much larger than the stamens :
13a. Anthers 3 ; staminodes more than 2 cm long ... 10. *Pentapetes*
13b. Anther solitary ; stamindoes up to 1 cm long ... 11. *Melhania*
12b. Staminodes sub-spathulate slightly larger than the stamens :
14a. Stamens covered by the hooded apices of the petals ... 12. *Guazuma*
14b. Stamens open ... 13. *Abroma*
11b. Anther solitary alternating with the staminodes ... 14. *Byttneria*
10b. Staminodes absent :
15a. Staminal cup cylindrical, narrowed at the mouth (gynoecium 5-carpellary) ... 15. *Melochia*
15b. Staminal cup ob-conic, wider at the mouth (gynoecium 1-carpellary) ... 16. *Waltheria*

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REFERENCES

BENTHAM, G. AND J. D. HOOKER. *Genera Plantarum* 1 : 214-228. London. 1862.

GOLDBERG, A. The genus *Melochia* L. (Sterculiaceae). *U. S. Nat. Herb.* 34 : 191-363. 1963.

HUTCHINSON, J. *The Genera of Flowering Plants* 497-522. Oxford. 1967.

—— *Evolution and Phylogeny of Flowering Plants* 239-247. London, New York. 1969.

—— *The Families of Flowering Plants* ed. 3, 309-310. Oxford. 1973.

KOSTERMANS, A. J. G. H. The Genus *Firmiana* Marsili (Sterculiaceae) in *Reinwardtia* 4(2) : 281-310. 1957.

—— A monograph of the genus *Heritiera* Aiton (Stercul.) *Ibid.* 4(4) : 465-583. 1959.

MASTERS, M. T. IN J. D. HOOKER et al. Flora of British India 1 : 353-379. London. 1874.

RAO, C. VENKATA. Floral Anatomy of some Sterculiaceae with special reference to the position of stamens in *Journ. Indian bot. Soc.* 28(4) : 237-245. 1949.

—— Floral Anatomy of some Malvales and its bearing on the afinities of families included in the order. *Ibid.* 32(3) : 171-203. 1952.

SCHUMANN, K. IN A. ENGLER AND K. PRANTL. *Die naturlichen Pflanzenfamilien.* teil 3, abteilung 6, 69-99. Leipzig. 1890.

VAN HEEL, W. A. Morphology of the Androecium in Malvales. *Blumea* 13(2) : 177-394. 1966.